FOREST INSECT AND DISEASE CONDITIONS

in the

Intermountain Region

1997

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INTRODUCTION

This report summarizes the status of forest insect and disease activity in the Intermountain Region (Region 4), comprising parts of Idaho, Utah, Nevada, Wyoming and California. Insect status is based largely on aerial detection surveys conducted over approximately 21,000,000 acres of forested lands in 1997. Disease status is based largely on ground observations and surveys. General insect and disease information is summarized in the Summary of Conditions.

The Special Project Update summarizes on-going studies conducted by Forest Health Protection in cooperation with other Regions, Forest Service Research, and universities.

Recent publications are listed to assist the reader in locating recent pest information of interest.

Two appendices include various tables and figures. Acres surveyed by administrative area during 1997 are summarized in Table 1. Numbers of trees killed by major bark beetles and affected acres are displayed in Tables 2 through 9. Figure 1 depicts the relative number of trees killed by bark beetles in Region 4 between 1981 and 1997. Figure 2 depicts acres defoliated by Douglas-fir tussock moth and western spruce budworm in Region 4 between 1960 and 1997. Figure 3 displays the areas aerially surveyed in the Region during 1997. General location of major insect activity is shown in Figures 4 through 8.

If the appendices are not included in this document, they can be obtained under separate cover from the Internet at **http://www.fs.fed.us/r4/health/cond97fm.htm** or from the Boise Field Office at the address on page iii.

SUMMARY OF CONDITIONS

Mountain pine beetle-caused tree mortality increased in southern Idaho and western Wyoming and decreased in Utah. regionwide, 33,000 trees were killed in 1997, compared to 29,100 trees killed in 1996. The largest outbreaks are located on the Payette National Forest in Idaho and on the Dixie and Manti-LaSal National Forests in Utah. A complex of mountain pine beetle and roundheaded pine beetle continued to kill ponderosa pine trees on the Manti-LaSal National Forest in southern Utah. An increase in mortality of whitebark and limber pine trees attributed to mountain pine attack occurred in 1997 with 6,700 trees killed. The largest outbreaks were located on the Payette and Bridger-Teton National Forests in southern Idaho and western Wyoming, respectively.

Jeffrey pine beetle activity declined significantly on the Toiyabe National Forest and nearby Federal, State and private lands in the Tahoe Basin.

Spruce beetle caused mortality decreased slightly with approximately 70,700 trees killed in 1997 compared to 82,500 trees killed in 1996. No significant mortality was recorded in southern Idaho or western Wyoming. In Utah, mortality decreased on the Manti-LaSal and Fishlake National Forests and remained static on the Dixie National Forest. Mortality is expected to increase on the Dixie and Fishlake National Forests as 1997 attacks become visually apparent in 1998.

Douglas-fir mortality, caused by the Douglas-fir beetle decreased three fold with 21,700 trees killed in 1997 compared to 62,700 trees killed in 1996. Decreases in mortality occurred in southern Idaho and western Wyoming while mortality increased in Utah. Outbreaks are located on the Boise, Salmon-Challis, Payette, Sawtooth and Targhee National Forests in southern Idaho. In Utah, outbreaks are located the Manti-LaSal, Ashley, Dixie, Fishlake, Uinta and Wasatch-Cache National Forests.

Western pine beetle caused mortality of ponderosa pine remained static with 4,900 trees killed in 1997 compared to 4,300 trees in 1996. Mortality is located on the Boise, Payette, and Sawtooth National Forests in southern Idaho. Pine engraver beetle activity was frequently associated with western pine beetle infestation. A complex of western balsam bark beetle, twig beetle, secondary bark beetle, wood borer, engraver beetle, environmental conditions, and disease pathogens continues to damage and kill subalpine fir throughout the Region. Mortality levels increased in 1997 with 133,000 dying trees observed, while in 1996, 418,800 trees were killed. Mortality occurs throughout the host type, affects trees of all size classes and currently is the most widespread cause of visible mortality in the Region.

Fir engraver beetle mortality decreased in Idaho and Nevada, and increased in Utah. Regionwide, 22,600 true fir trees were killed in 1997 compared to 46,100 trees in 1996. Much of this decrease is attributed to a decline in activity on the Toiyabe National Forest in Nevada. Outbreaks are located on the Toiyabe National Forest in Nevada, the Manti-LaSal and Uinta National Forests in Utah, and on the Boise National Forest in southern Idaho.

Foliage diseases of *Populus* species were epidemic again in 1997. Defoliation by the fungus *Marssonina* was common throughout Utah and southern Idaho.

For the fourth consecutive year Gambel oak along the Wasatch Front in northern Utah has suffered notable defoliation caused by fall cankerworm. Approximately 4,900 acres of visible defoliation were recorded.

Status of Insect Conditions
Native

Defoliators

Douglas-fir tussock moth *Orgyia pseudotsugata*

Location: Idaho, Nevada, Utah
Host: Douglas-fir, True firs

No visible defoliation from Douglas-fir tussock moth was observed in the Region during 1997.

Western spruce budworm *Choristoneura occidentalis*

Location: Idaho, Utah, Wyoming
Host: Douglas-fir, True firs

No visible defoliation from spruce budworm was observed in the Region during 1997.

Cooley spruce gall adelgid *Adelges cooleyi*

Location: Idaho, Utah, Wyoming
Host: Spruce, Douglas-fir

This adelgid was found in forested stands and ornamental trees throughout the Region; impact is greatest on ornamental spruce trees. On Douglas-fir, the alternative host, infested needles often develop a yellow spot and twist at the point of attack.

Fall cankerworm *Alsophila pometaria*

Location: Utah
Host: Gambel oak

Defoliation on gambel oak (*Quercus gambellii*) occurred along the Wasatch Front in northern Utah from Spanish Fork to Brigham City. Approximately 4,900 acres of moderate to heavy defoliation ranging from less than one to several hundred acres were observed in the spring of 1997. This is the fourth consecutive year of this defoliation.

Pine sawflies *Neodiprion* sp.

Location: Idaho
Host: Ponderosa pine

Defoliation of ponderosa pine caused by a sawfly was detected throughout the Little Weiser river drainage on the Payette National Forest.

Sagebrush leaf beetle *Trirhabda* sp.

Location: Idaho
Host: Sagebrush

Heavy defoliation of sagebrush caused by a leaf beetle was detected in rangeland south of Twin Falls, Idaho.

Xyelid sawfly *Xyella sp.*

Location: Idaho
Host: Ponderosa pine

Localized populations of this sawfly were detected feeding on pine pollen in the Boise River drainage on the Boise National Forest.

Bark beetles

Douglas-fir beetle *Dendroctonus pseudotsugae*

Location: Idaho, Utah, Wyoming
Host: Douglas-fir

Mortality decreased regionwide, with 21,700 trees killed in 1997 compared to 62,700 in 1996. Outbreaks were located on the Sawtooth, Boise, Salmon-Challis, Caribou, Targhee and Payette National Forests in southern Idaho. In Utah, tree mortality increased with 12,600 trees killed in 1997. Outbreaks were located on the Manti-LaSal, Ashley, Dixie, Fishlake, Uinta, and Wasatch-Cache National Forests. Mortality on the Bridger-Teton National Forest in western Wyoming decreased from 1,500 trees in 1996 to 900 trees in 1997.

Fir engraver beetle *Scolytus ventralis*

Location: California, Idaho, Nevada, Utah
Host: Grand fir, Red fir, Subalpine fir, White fir

Regionwide, mortality decreased significantly with 22,600 trees killed in 1997 compared to 46,400 trees in 1996. Most of this decrease can be attributed to a decline in tree mortality on the Toiyabe National Forest and on Federal, State and private lands in the Tahoe Basin Management area. In southern Idaho, mortality remained low with 300 trees killed. Fir engraver beetle activity in Utah increased with 20,000 trees killed in 1997 compared to 12,300 trees killed in 1996. The largest outbreak was located on the Manti-LaSal National Forest where 9,800 trees were killed. Activity was also located on the Uinta, Dixie, and Fishlake National Forests.

Jeffrey pine beetle *Dendroctonus jefferyi*

Location: California, Nevada
Host: Jeffrey pine

A significant decline in Jeffrey pine beetle activity was observed on the Toiyabe National Forest and Tahoe Basin Management area with only 300 trees killed in 1997 compared to 4,100 trees in 1996.

Mountain pine beetle *Dendroctonus ponderosae*

Location: Idaho, Nevada,Utah, Wyoming
Host: Limber, Lodgepole, Jeffrey, Ponderosa, Whitebark pines

Mountain pine beetle-caused mortality increased from 29,100 trees in 1996 to 35,000 trees in 1997. The largest outbreak in the Region was located on the Payette National Forest in southern Idaho where 7,500 lodgepole pine trees were killed. Some of this mortality was associated with recent wildfire activity. Elsewhere in southern Idaho significant mortality occurred on the Caribou and Sawtooth National Forests. Small outbreaks occurred on the Boise, Salmon-Challis, and Targhee National Forests. In Utah, 10,000 trees were killed during 1997 opposed to 29,100 trees in 1996. The largest outbreaks were located on the Dixie and Manti-LaSal National Forests where 3,900 and 1,100 ponderosa pine trees were killed, respectively. Smaller outbreaks were located on most other National Forests in Utah. On the Bridger-Teton National Forest in western Wyoming, 1,900 lodgepole pine trees were killed in 1997.

Mortality of whitebark and limber pine attributed to mountain pine beetle attack continued to occur with 6,100 trees killed in the Region. The largest outbreaks were on the Payette National Forest in southern Idaho with 2,800 trees killed, the Bridger-Teton National Forest in western Wyoming, and the Manti-LaSal National Forest in Utah.

Pine engraver beetle *Ips pini*

Location: Idaho, Nevada, Utah
Host: Lodgepole, Ponderosa pine

Mortality due to pine engraver beetle remained static throughout the Region. Activity is often associated with western pine beetle. In Utah, populations were found in slash of ponderosa and lodgepole pine.

Roundheaded pine beetle *Dendroctonus adjunctus*

Location: Utah
Host: Ponderosa pine

Ponderosa pine mortality is being caused by this beetle on the Dixie and Manti-LaSal National Forests.

Spruce beetle *Dendroctonus rufipennis*

Location: Idaho, Utah, Wyoming
Host: Spruce

Spruce mortality decreased slightly from 1996 levels with 70,700 trees killed Regionwide. The largest infestations were located in Utah where 69,900 trees were recorded. Mortality was heaviest on the Dixie, Fishlake, and Manti-LaSal National Forests. No significant mortality was observed in southern Idaho National Forests or on the Bridger-Teton National Forest in western Wyoming.

Western pine beetle *Dendroctonus brevicomis*

Location: Idaho
Host: Ponderosa pine

Western pine beetle activity remained static in southern Idaho with 4,900 trees killed in 1997 compared to 4,300 trees in 1996. Mortality was located on the Boise, Payette, and Sawtooth National Forests. Pine engraver beetle activity was frequently associated with western pine beetle infestation.

Others

Bracken Fern Sawfly *Strongylogaster* sp.

Location: Idaho
Host: Bracken fern

This sawfly which pupates in ponderosa pine and feeds on Bracken fern was found boring into ponderosa pine bark in the Scriver Creek drainage near Crouch, Idaho.

Sequoia pitch moth *Synanthedon sequoiae*

Location: Nevada
Host: Lodgepole, Ponderosa pine

Localized populations are found on the east side of the Sierras, on the Toiyabe National Forest. Some activity has been observed, affecting ornamental Jeffrey pine in Carson City, Nevada.

Status of Insect Conditions
Non-native

European gypsy moth *Lymantria dispar*

Location: Idaho, Nevada, Utah
Host: Various deciduous species

The gypsy moth was first detected in Utah in 1988. Between 1989 and 1993 approximately 72,000 acres of Federal, State, and private lands were treated with *Bacillus thuringiensis (Bt)*. In 1995, after two years of intensive trapping resulting in no moth captures, the gypsy moth was declared eradicated.

In 1997, 46 moths were captured in Salt Lake City and one moth on the Wasatch-Cache National Forest. The moths are thought to have been reintroduced by the movement of household goods from an infested area as opposed to being a residual population. The Utah Department of Agriculture, in cooperation with the USDA Forest Service and other agencies, propose treatment of 801 acres of private lands and 115 acres of Federal lands in 1998. An integrated pest management approach will be used for eradication including treatment with *Bt*, mass trapping, and quarantine, if necessary.

Larch casebearer *Coleophora laricella*

Location: Idaho
Host: Western larch

Western larch on the Payette National Forest were defoliated by the larvae of this exotic moth. Defoliation also occurred in residential areas of McCall and Cascade, Idaho.

Satin moth *Leucoma salicis*

Location: Idaho
Host: Willow

Heavy defoliation of willow caused by the larvae of the satin moth was detected near Donnelly, Idaho.

Poplar-and-willow borer *Cryptorhynchus lapathi*

Location: Idaho
Host: Willow

The larvae of this weevil are defoliating and causing stem mortality of Scouler willow on the west side of the Grand Teton Range in extreme southeastern Idaho.

Status of Stem and Branch Diseases
Native

Aspen trunk rot *Phellinus tremulae*

Location: Idaho, Nevada, Utah, Wyoming
Host: Aspen

Decay occurs in most aspen stands in the Region and is increasingly common as aspen stands exceed 80 years of age.

Comandra blister rust *Cronartium comandrae*

Location: Idaho, Utah, Wyoming, Nevada
Host: Lodgepole, Ponderosa pine

Infection occurs infrequently throughout Idaho and Wyoming. Heavy, localized areas of infection resulting in branch, top, and entire tree mortality of sapling size ponderosa pines occurs in southern Idaho. In Wyoming and northern Utah, infection frequently occurs on lodgepole pine in localized pockets.

Cytospora canker of true firs *Cytospora abietis*

Location: Idaho, Utah, Nevada, Wyoming
Host: True firs

Branch flagging, top-killing, and mortality attributed to this fungus occurs wherever host is found. This disease is associated with environmental stress damage, drought, frost, and freezing. Western balsam bark beetle frequently kills the diseased trees.

Dwarf mistletoes *Arceuthobium spp*

Location: Idaho, Nevada, Utah, Wyoming
Host: Douglas-fir, Pines, Western Larch

Suppression projects continue to remove infected overstory trees; however, this forest disease remains the most widespread and frequently observed disease within the Intermountain Region. Regional incidence by major host species is estimated as follows: lodgepole pine 50 percent, ponderosa pine 20 percent, and Douglas-fir 20 percent infected. These numbers represent the percentage of host stands having some level of infection.

Limb rust *Peridermium filamentosum*

Location: Utah
Host: Ponderosa pine

Infection causing branch mortality and occasional tree mortality occurs in all size classes of trees on the Dixie National Forest in southern Utah.

Pinyon blister rust *Cronartium occidentale*
Location: Idaho, Utah
Host: Pinyon pine

This disease occurs in the Raft River Mountains on the Sawtooth National Forest, Idaho.

Red ring rot *Phellinus pini*

Location: Idaho, Nevada, Utah, Wyoming
Host: Douglas-fir, Pines, Spruce, Western Larch

Infection intensity varies throughout stands in the Region.

Rust-red stringy rot *Echinodontium tinctorium*

Location: Idaho, Nevada, Utah
Host: Grand fir, Subalpine fir, White fir

Decay caused by this fungus is common in mature and over mature stands of true firs.

Stalactiform blister rust *Cronartium coleosporiodes*

Location: Idaho, Nevada, Utah
Host: Lodgepole pine

This rust occurs in localized areas throughout the host type. Heavy infection has been noted in very localized areas on the Boise, Payette, Sawtooth, and Challis National Forests in Idaho.

True mistletoe on juniper *Phoradendron juniperinum*

Location: Nevada, Utah
Host: Junipers

Occurring throughout the pinyon-juniper forest type in Utah and Nevada, this disease spreads and intensifies slowly and is therefore more common in older stands.

Western gall rust *Endocronartium harknessii*

Location: Idaho, Utah, Wyoming
Host: Lodgepole, Ponderosa pine

Gall rust occurs throughout the host types. Infection levels vary, with localized heavy infection present in both host species.

Other stem decays: *Cryptoporus volvatus, Fomitopsis officinalis, Laetiporus sulphureus*

Location: Idaho, Nevada, Utah, Wyoming
Host: Various conifers

A large number of minor stem decay agents, too numerous to list, occur with varying intensity throughout the Region.

Status of Root Diseases

Native

Annosus root disease *Heterobasidion annosum*

Location: California, Idaho, Nevada, Utah, Wyoming
Host: Bitterbrush, Chokecherry, Douglas-fir, Jeffrey pine, Lodgepole pine, Ponderosa pine, Spruce, True firs

This root disease fungus can be found throughout the Region, but mostly as a decay organism. The fungus is occasionally damaging to young, planted stands of ponderosa pine on droughty soils.

Armillaria root disease *Armillaria* spp.

Location: Idaho, Nevada, Utah, Wyoming
Host: Douglas-fir, Grand fir, Pines, Spruce, Subalpine fir

Evidence of armillaria root disease can be found throughout the Region functioning primarily as a weak pathogen or saprophyte causing little direct mortality. In southern Utah, it may act as a primary pathogen, killing mature and immature ponderosa pine and mature fir and spruce.

Black stain root disease *Ophiostoma wageneri*

Location: Idaho, Nevada, Utah
Host: Pinyon pine

This fungus causes mortality of pinyon pine on the Bureau of Land Management Burley District in Idaho, on the Humboldt and Toiyabe National Forests in Nevada, and on the Dixie and Manti-LaSal National Forests in Utah.

Schweinitzii butt rot *Phaeolus schweinitzii*

Location: Idaho
Host: Douglas-fir, Spruce, Ponderosa pine

Decay is common in mature and over mature forests throughout the host type, especially those with a frequent fire or logging history. The fungus is often associated with other root pathogens and bark beetle activity. Trees are seldom killed directly as a result of infection.

Tomentosus root disease *Inonotus tomentosus*

Location: Idaho, Utah
Host: Douglas-fir, Spruce, Subalpine fir

This fungus is found alone or associated with *Phaeolus schweinitzii* and *Armillaria* spp. It causes root and butt rot of pole sized and larger trees, predisposing them to bark beetle attack and windthrow. In southern Utah, it kills spruce in progressively enlarging disease centers.

White mottled rot *Ganoderma applanatum*

Location: Idaho, Nevada, Utah, Wyoming
Host: Aspen

This pathogen is increasing in incidence throughout the Region. The disease can be found on windthrown aspen on the Dixie, Wasatch-Cache, and Fishlake National Forests in Utah; Humboldt National Forest in Nevada; and Caribou and Sawtooth National Forest in Idaho.

Status of Foliage Diseases
Native

Conifer - Aspen rust, Conifer - Cottonwood rust *Melampsora medusae, Melampsora occidentalis*

Location: Idaho
Host: Aspen, Conifers, Cottonwood

Endemic throughout the host range of all *Populus* species. The fungus has not been observed recently on the main conifer host, Douglas-fir, so it may be overwintering on *Populus* due to mild winters.

Douglas-fir needle cast *Rhabdocline* spp.

Location: Idaho, Wyoming
Host: Douglas-fir

Incidence was light with infection noted throughout the range of Douglas-fir in southwestern Idaho.

Elytroderma disease *Elytroderma deformans*

Location: Idaho
Host: Ponderosa pine

Systemic and annual infections occur throughout the host type.

Fir broom rust *Melampsorella caryophyllacearum*

Location: Idaho, Nevada, Utah, Wyoming
Host: Subalpine fir

Infections occur throughout the host's range. Infection intensity varies significantly, but is common in stands south of the Snake River in Idaho.

Fir needle cast *Lirula* spp.

Location: Idaho
Host: Grand fir, Subalpine fir

Infection is at endemic levels throughout the host type.

Fir needle rust *Pucciniastrum epilobii*

Location: Idaho, Wyoming
Host: Subalpine fir

Scattered infection occurs on seedling and sapling size trees throughout the host type.

Incense cedar broom rust *Gymnosporangium libocedri*

Location: California, Nevada
Host: Incense cedar

This disease occurs in isolated patches of host trees on the Toiyabe National Forest.

Larch needle diseases *Meria laricis, Hypodermella laricis*

Location: Idaho
Host: Western larch

Incidence and severity of infection in west central Idaho is cyclical. In 1997, these diseases were overshadowed by larch defoliation caused by the larch casebearer.

Lodgepole pine needle cast *Lophodermella concolor*

Location: Idaho
Host: Lodgepole pine

Infection intensity is worse following periods of drought. During intervening years, the disease is of minor localized importance.

Marssonina blight *Marssonina populi*

Location: Idaho, Utah, Wyoming
Host: Aspen

The disease was epidemic in 1997 in central and eastern Idaho, northern Utah, and western Wyoming. Affected trees had brown colored foliage from mid-July until leaf drop.

Pine needle rust *Colesporium* spp.

Location: Idaho
Host: Lodgepole, Ponderosa pine

Scattered incidence of light to moderate intensity occurred throughout the host types in southern Idaho.

Spruce broom rust *Chrysomyxa arctostaphylii*

Location: Idaho, Utah, Nevada, Wyoming
Host: Englemann spruce

Scattered infections occurred throughout the host type, especially in eastern Idaho and in localized pockets on the Fishlake National Forest, Utah.

Status of Stem and Branch Diseases
Non-native

White pine blister rust *Cronartium ribicola*

Location: Idaho, Nevada, Utah, Wyoming
Host: Limber, Whitebark, Sugar, Bristlecone, Western white pine

A formal survey of five-needled pines was conducted in 1995-1997 to quantify disease incidence and intensity, and determine site and stand characteristics of infected areas. A final report is forthcoming.

Declines/Complexes

Subalpine fir Mortality Complex
Dryocetes confusus, Pityophthorus sp., *Pityokeines* sp., *Crypturgus* sp., *Scolytus* sp., *Heterobasidion annosus, Armillaria* sp., *Cytospora abietis, Melampsporella caryophyllacearum*

Location: Idaho, Utah, Wyoming
Host: Subalpine fir

Subalpine fir decline and mortality continues to occur throughout host type in the Region. Ground examinations suggest a complex of factors are involved in this mortality. These factors include: twig beetles, secondary bark beetles, wood borers, engraver beetles, root diseases, cankers, rusts, and environmental conditions.

In 1997 this complex resulted in the death of 133,300 trees throughout the Region compared to 121,200 in 1996. This mortality complex is the most widespread cause of visible mortality in the Region.

Status of Nursery Insects and Diseases

Fusarium root disease *Fusarium oxysporum*

Location: Idaho, Utah
Host: Douglas-fir, Ponderosa pine, Spruce, True firs

This disease causes low levels of mortality primarily of 1-0 conifer seedlings at the Lucky Peak Nursery, Boise National Forest, Idaho and the Lone Peak Nursery in Utah.

Phytophthora/Pythium root rot *Phytophthora* spp., *Pythium* spp.

Location: Idaho, Utah
Host: Douglas-fir, Spruce

These fungi occur infrequently on seedlings and in soil at the Lucky Peak Nursery, Boise National Forest, Idaho, and the Lone Peak Nursery in Utah. Infection results in patch mortality and culling of 2-0 seedlings

SPECIAL PROJECT UPDATE

Fire Survival Plots Fire survival plots were installed in 1995 in six areas burned during 1994 wildfires on the Payette National Forest. These areas were selected because they represented underburn conditions in Douglas-fir, grand fir, and subalpine fir habitat types. The objective of this study is to develop criteria which would accurately classify trees expected to die as a result of fire injury. These plots were again monitored in 1997. Contact: Julie Weatherby

Permanent Plots to Validate Forest Disease Models This is an ongoing project to establish permanent plots to aid in the validation of disease models including the dwarf mistletoe model, the western root disease model, as well as models for comandra blister rust and limb rust. These plots were installed in forests containing ponderosa pine, lodgepole pine, and Douglas-fir dwarf mistletoes. Contact: John Guyon.

Thinning Second Growth Ponderosa Pine as a Management Strategy for Western Pine Beetle Evaluation of an investigation on the Idaho City Ranger District, Boise National Forest, continues to determine if differences exist in tree mortality among stands of second growth ponderosa pine thinned to two different densities and an unthinned check stand in the presence of western pine beetle infestation. Plots were monitored in 1997. Contact: Ralph Thier

White Pine Blister Rust Survey of the Intermountain Region A three year study was completed in 1997 to investigate the current distribution of white pine blister rust in the Intermountain Region. Whitebark, limber and bristlecone pines are hosts to the disease. Overall blisterrust is widespread in southern Idaho and western Wyoming. It was not found in northern Nevada or northern Utah. A final report is being prepared. Contact: J. Smith, Jim Hoffman

Rush Skeltonweed Research This multi-year project involves a collaborative partnership with Forest Health Protection and Forest Service Research, along with several other federal and state agencies, universities, and private individuals to increase the effectiveness of biological controls for rush skeltonweed. Priorities for 1998 include: a continued search for potential pathogens and insect biological control agents in Uzbekistan and the Republic of Georgia; and testing the many rust pathogens currently known on North American varieties of skeltonweed at the Agriculture Research Service laboratory in Montpellier, France. A colony of the root feeding moth *Bradyyrrhoa gilveolla* has been established in the Montana State University quarantine in Bozeman, MT. The insect is undergoing final host testing on native species of North American asteraceae. Contact: Tom Barbouletos

Biological Control for Noxious Weed Management Theses projects involve coordination with federal agencies, multi-state agencies, counties, universities, and private individuals in collecting and exchanging biological agents to conduct operational and insectary

releases for the management of noxious weeds. Information, new technologies, and educational materials are developed and shared in a collaborative stewardship approach to this growing problem. Contact: Tom Barbouletos

Leafy Spurge Special Technology Development Project The project continued this year, with most of the 22,000 acres of leafy spurge having been mapped and the individual site characteristics delineated. Objectives for this year include completing the mapping and site characteristic delineation, monitoring of agent populations, and vegetative sampling to determine impacts of the released agents on the leafy spurge. A final report is due this fall. Contact: Tom Barbouletos

Non-Target Surveys This project is a cooperative effort between FHP and Carnegie Museum of Natural History. The objective of the two year survey (1997 & 1998) is to document the biodiversity of selected non-target arthropods likely to have been or could be affected by spraying of microbial insecticides during eradication of the gypsy moth along the Wasatch Front of northern Utah. Non-target arthropod biodiversity will be compared between sites treated and those not treated with Bacillus thuringiensis. Also, a number of habitats are being sampled to obtain a comprehensive background of macrolepidoptera along the Wasatch Front. Contact: John Anhold

Tools and Information for Predicting and Monitoring Spruce Beetle Populations Four plots were established on the Wasatch-Cache and Dixie National Forests to identify key temperature regimes which have an effect on life cycle duration and success of spruce beetle populations in northern and southern Utah. These measurements will assist in developing a model to predict population increases/decreases. Similar techniques and model prototypes have been developed for mountain pine beetle. Statistical analysis of 1997 data will be used to correlate temperature regimes to duration of generation times. Results from 1997 on factors influencing hibernation are inconclusive. Temperature probes and hibernation emergence will be monitored in 1998. Contact: Steve Munson

Factors Influencing Spruce Beetle Population Dynamics and Silvicultural Implications for Spruce Beetle Management Study sites were established on theManti-LaSal National Forest to monitor seasonal availability of downed host material. The objective is to determine whether spruce beetle colonization, brood production, and larval survival differ with respect to the time of year downed host material is produced. Study pairs of Englemann spruce were selected and dropped, one in the fall of 1996 and the other in the spring of 1997 before beetle flight. All trees were visited in late July-August of 1997 to record attacks on each host. In the spring of 1998 trees will be sampled to quantify the number of emerging adults. Another study has been established on the Fishlake National Forest to examine the effects of varying stand densities on spruce susceptibility. Three stand treatments at various basal areas will be monitored to determine spruce beetle impacts. Contact: Steve Munson

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Orland, B., and S. Munson. 1997. Implementing Data Visualization in Intergrated Forest Planning. Contact No. AG 53-84M8-4-0028, Ogden, UT p.58.

Weatherby, J., J. Roberts, S. Donnelly, K. Ogle, and G. Jacobsen, 1997 Simulated successional pathways for a a representative grand fir habitat on the Payette National Forest. FHP Report R4-97-04. Ogden, UT. USDA Forest Service, Intermountain Region, 34 p.

APPENDIX A

TABLE 1 Number of acres aerially surveyed by administrative area during 1997.

OWNERSHIP	ACRES FLOWN
Boise NF	1,992,400
Ashley NF	921,900
Bureau of Land Management	936,200
Bridger-TetonNF	2,400,900
Caribou NF	1,009,200
Challis NF	632,400
Bureau of Reclamation	50,500
Dixie NF	1,410,300
Fishlake NF	1,105,400
Fort Hall Indian Reservation	60,300
Bryce Canyon National Park	29,800
State and Private Lands, Idaho	1,806,900
State and Private Lands, Nevada	82,500
Manti-LaSal NF	1,215,600
Cedar Breaks NM	6,000
Payette NF	1,495,800
Salmon NF	1,187,200
Sawtooth NF	1,511,600
Targhee NF	953,624
Toiyabe NF	136,634
Uinta NF	732,200
State and Private Lands, Utah	1,738,100
Wasatch-Cache NF	940,900
State and Private Lands, Wyoming	192,300
Glen Canyon NP	45,000
1997 Total	22,593,658

TABLE 2 Status of mountain pine beetle infestations by state during 1997.

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	15.9	19.5
	Other Federal	0.5	0.5
	State and Private	1.7	1.5
Idaho Total		**18.1**	**21.5**
Utah	National Forest	14.6	9.1
	Other Federal	0.2	0.1
	State and Private	6.1	0.8
Utah Total		**20.9**	**10.0**
Wyoming	National Forest Other Federal State and Private	3.5 0.0 0.0	3.5 0.0 0.0
Wyoming Total		**3.5**	**3.5**
Grand Total		**42.5**	**35.0**

TABLE 3 Status of spruce beetle infestations by state during 1997.

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	0.2	0.3
	Other Federal	0.0	0.0
	State and Private	0.1	0.1
Idaho Total		**0.3**	**0.4**
Utah	National Forest	68.8	66.0
	Other Federal	0.2	0.1
	State and Private	4.9	3.8
Utah Total		**73.9**	**69.9**
Grand Total		**74.2**	**70.3**

TABLE 4 Status of Douglas-fir beetle infestations by state during 1997.

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	4.3	5.4
	Other Federal	0.5	0.6
	State and Private	0.5	0.6
Idaho Total		**5.3**	**6.6**
Utah	National Forest	13.0	12.6
	Other Federal	0.2	0.2
	State and Private	1.2	1.4
Utah Total		**14.4**	**14.2**
Wyoming	National Forest Other Federal State and Private	0.6 0.0 0.0	0.9 0.0 0.0
Wyoming Total		**0.6**	**0.9**
Grand Total		**20.3**	**21.7**

TABLE 5 Status of western pine beetle/Ips beetle infestations by state during 1997.

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	2.8	3.9
	Other Federal	0.2	0.1
	State and Private	1.5	0.9
Idaho Total		**4.5**	**4.9**
Grand Total		**4.5**	**4.9**

TABLE 6 Status of Jeffrey pine beetle infestations by state during 1997.

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Nevada	National Forest	0.3	0.3
	Other Federal	0.0	0.0
	State and Private	0.5	0.5
Nevada Total		**0.8**	**0.8**
Grand Total		**0.8**	**0.8**

TABLE 7 Status of subalpine fir mortality complex by state during 1997.

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	17.3	17.1
	Other Federal	1.4	1.7
	State and Private	24.1	10.5
Idaho Total		**42.8**	**29.3**
Utah	National Forest	75.0	73.1
	Other Federal	0.1	0.1
	State and Private	9.2	10.0
Utah Total		**16.8**	**83.2**
Wyoming	National Forest	56.3	43.1
	Other Federal	1.4	2.2
	State and Private	1.4	0.9
Wyoming Total		**69.1**	**46.2**
Grand Total		**128.7**	**158.7**

TABLE 8 Status of fir engraver beetle infestations by state during 1997.

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	0.2	0.3
	Other Federal	0.0	0.0
	State and Private	0.0	0.0
Idaho Total		**0.2**	**0.3**
Utah	National Forest	25.1	17.7
	Other Federal	0.2	0.1
	State and Private	3.3	2.3
Utah Total		**28.6**	**20.1**
Nevada	National Forest	1.7	1.8
	Other Federal	0.0	0.0
	State and Private	0.3	0.4
Nevada Total		**2.0**	**2.2**
Grand Total		**30.8**	**22.6**

TABLE 9. Number of trees killed and acres affected by bark beetles on National Foests of Region 4 during 1997 as determined by aerial detection surveys.

	Mountain Pine Beetle		**Douglas-fir Beetle**		**Western Pine Beetle/Ips**		**Spruce Beetle**		**Fir Engraver Beetle**		**Subalpine Fir Mortality Complex**		**Jeffrey Pine Beetle**		**Totals**	
Forest	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Ashley	800	500	2,800	1,300			200				2,500	39,400			**6,300**	**41,200**
Boise	700	400	500	17,500	1,100	1,600		100			300	1,900			**2,600**	**21,500**
Bridger-Teton	2,600	200	800	900			300				39,900	39,400			**43,600**	**40,500**
Caribou	600	1,200	500	1,100							9,600	6,500			**10,700**	**8,800**
Challis	500	200	250	100							2,200	1,000			**2,950**	**1,300**
Dixie	4,400	9,100	500	400			23,800	33,600	2,500	3,000	19,600	25,900			**50,800**	**72,000**
Fishlake	700	1,100	1,500	3,400			2,700	4,800	4,200	7,200	21,000	24,900			**30,100**	**41,400**
Manti-LaSal	2,400		2,600	3,600			37,400	27,500	8,100	13,500	16,700	17,600			**67,200**	**62,200**
Payette	10,200	8,800	1,600	1,600	2,600	4,200	300	200	200	200	200	200			**15,100**	**15,200**
Salmon	1,000	600	400	300							3,100	300			**4,500**	**1,200**
Sawtooth	2,200	2,300	1,400	1,000							2,900	3,000			**6,500**	**6,300**
Targhee	500	200	200	100							200	300			**900**	**600**
Toiyabe									2,000	1,400			400	300	**2,400**	**1,700**
Uinta			3,400	2,600			500	300	1,000	1,200	7,100	7,200			**12,000**	**11,300**
Wasatch- Cache	2,100	600	1,900	1,000			1,400	2,400			6,000	3,000			**11,400**	**7,000**
TOTAL	**28,700**	**25,200**	**18,350**	**34,900**	**3,700**	**5,800**	**66,600**	**68,900**	**18,000**	**26,500**	**131,300**	**170,600**	**400**	**300**	**267,050**	**332,200**

Appendix B